

MPS-801

DOT MATRIX PRINTER USER'S MANUAL



INFORMATION TO USER

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- REORIENT THE RECEIVING ANTENNA
- RELOCATE THE COMPUTER WITH RESPECT TO THE RECEIVER
- MOVE THE COMPUTER AWAY FROM THE RECEIVER
- PLUG THE COMPUTER INTO A DIFFERENT OUTLET SO THAT COMPUTER AND RECEIVER ARE ON DIFFERENT BRANCH CIRCUITS

"IF NECESSARY, THE USER SHOULD CONSULT THE DEALER OR AN EXPERIENCED RADIO/TELEVISION TECHNICIAN FOR ADDITIONAL SUGGESTIONS. THE USER MAY FIND THE FOLLOWING BOOKLET PREPARED BY THE FEDERAL COMMUNICATIONS COMMISSION HELPFUL: 'HOW TO IDENTIFY AND RESOLVE RADIO-TV INTERFERENCE PROBLEMS.' THIS BOOKLET IS AVAILABLE FROM THE U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402, STOCK NO. 004-000-00345-4."

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MPS-801

DOT MATRIX PRINTER

USER'S MANUAL

P/N 251319

 **commodore**
COMPUTER

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Section 1: GENERAL INFORMATION

Welcome to a new dimension in computing. Because you bought the Commodore MPS-801 printer, you've added a great deal of versatility and convenience to the use of your Commodore computer. This manual contains all the information you need to check out, hook up, and operate your printer, but in order to get the most out of your computer system you should continue to look at both your computer's User's Guide and Programmer's Reference Manual.

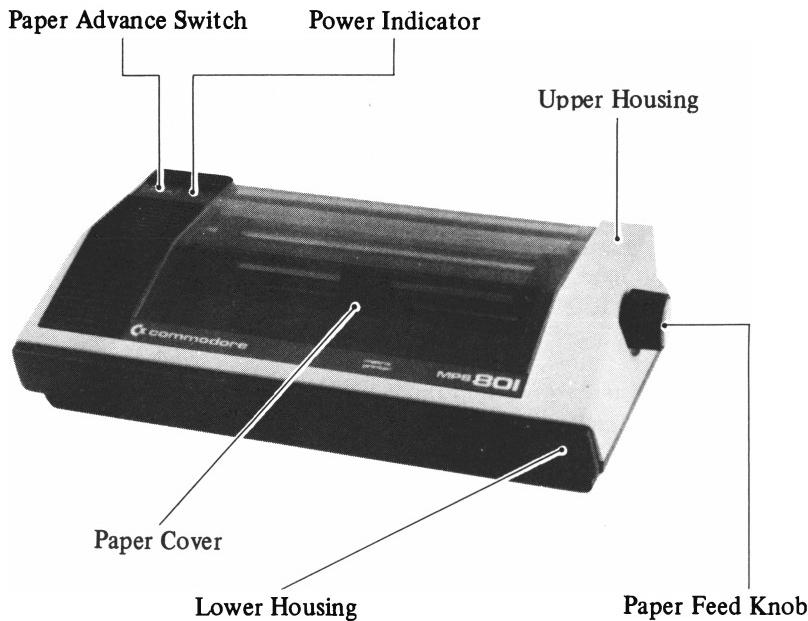
Your MPS-801 printer is designed to operate through software control. That means you have to make the printer's operation part of a program. For example the VIC-20 has a TYPEWRITER cartridge that comes in the VIC SIX-PACK.

The MPS-801 Printer prints both capital and small letters, numbers, and all the graphic characters available on your computer. It will even print custom made graphics and charts that you design on your VIC-20 or Commodore 64. In addition your printer has a variety of built-in functions of its own. This is because your printer has its own computer inside.

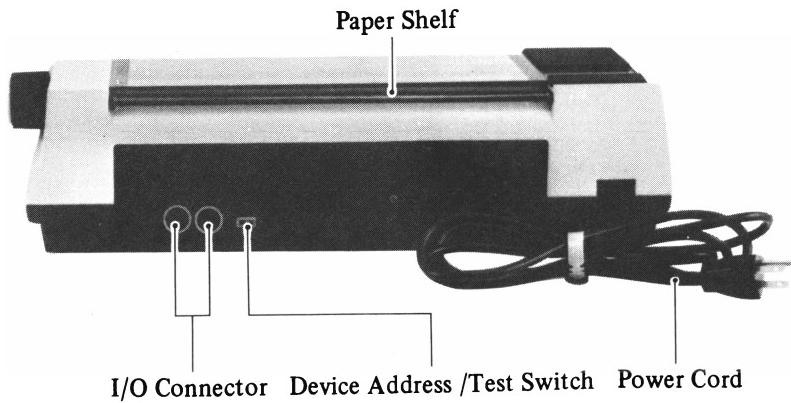
The advantages of this internal computer are 1) it automatically resets all its switches to the starting sequence every time you turn the printer on; 2) it contains its own internal memory which means that you can store information to be printed directly in the printer without using up your computer's memory.

Your printer is designed to connect directly into your computer through the Serial Port (6-pins). However, you can connect your printer to as many as 4 VIC disk drives by daisy-chaining. Daisy-chaining means connecting 1 peripheral to your computer and any additional peripherals plug into the Serial Port of the last item connected.

1. External Appearance and Names of Parts



1.1 Front View



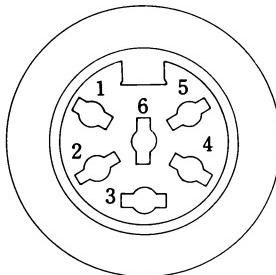
1.2 Rear View

2. Operating Your Printer

PART	OPERATION & FUNCTION
a. Power Switch:	Turns printer on and off
b. Power Indicator:	Lights up when printer is turned on
c. Self-Diagnostic Switch:	Select printer device number, “4” is the normal position for one printer. “5” is the position to use with your second printer. “T” is the self-diagnostic test position.
d. Printer Cover:	Use your cover to protect your printer from dust and to reduce the noise level while the printer is in operation.
e. Tractor Mechanism:	After loading your paper properly (see Section 2, part 3) the Tractor Mechanism should be snapped close to hold the paper in place. Tractor holes on the edges of the paper must line up with the pins of the Tractor Mechanism.
f. Paper Feed Knob:	Once you have properly threaded your paper, you can use the Paper Feed Knob to move the paper.
g. Paper Advance Switch:	Use this switch to move the paper ahead, 1 line at a time in the forward direction only!

3. Interface

1. Connector



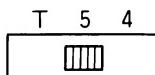
2. Interface

1.4

Pin No.	Signal
1	S E R I A L S R Q
2	G N D
3	S E R I A L A T N
4	S E R I A L C L K
5	S E R I A L D A T A
6	R E S

1.5

- a. Use the enclosed connecting cable to connect the printer to your computer. Plug one end of the 6-pin connector cable into the 6-hole Serial Port on your computer. Plug the other end of the 6-pin connector into the 6-hole connector of your printer. If you are facing the back of the printer, the connector hole is in the lower left (see figure 1.2).
- b. Select the device number .



1.6 Device Selector Switch

- c. Just as your computer has different character modes, so does your printer. To choose either the GRAPHICS/UPPER CASE or UPPER CASE/LOWER CASE mode, you must assign a SECONDARY ADDRESS (SA) so that the printer prints in the same mode that you've chosen for your computer. The secondary address can either be 0 or 7.

SA = 0: "CURSOR UP" (graphics/upper case) Mode

SA = 7: "CURSOR DOWN" (upper case/lower case) Mode

- d. If there is an error in your program that pertains to printer operation, your printer will stop printing and the appropriate error message will appear on the screen of your computer.

Section 2:

PREPARING TO USE YOUR PRINTER

1. Installation

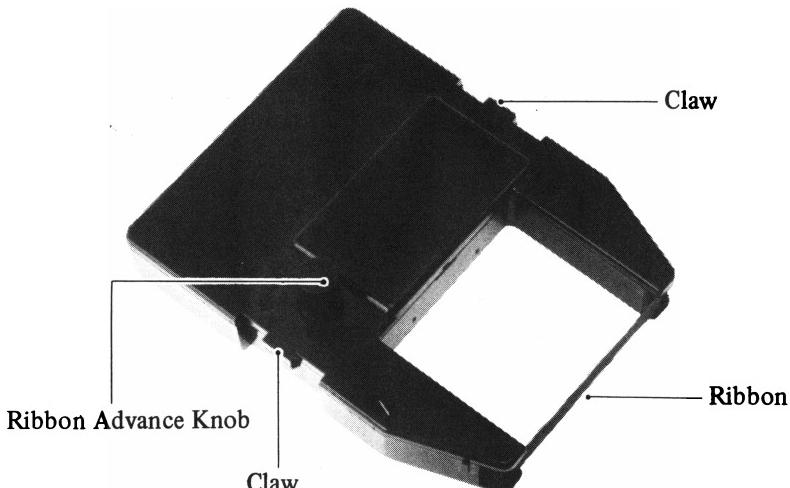
Please follow the precautions listed below when setting up your printer. These measures are designed to help you keep your printer functioning at its best.

- * Place your printer on a flat and level surface.
- * Avoid placing your printer in rooms with high humidity.
- * Keep your printer as dust-free as possible.
- * Keep your printer out of direct sunlight.
- * Avoid placing your printer through extreme temperature changes.

2. Installing and Removing the Ribbon Cassette

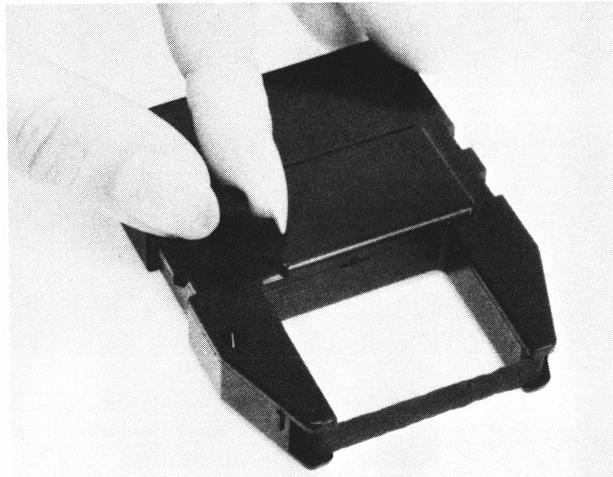
2.1 Installing the Ribbon Cassette

- a. Locate the packet that contains the ribbon cassette. You should have received this packet in the same box that your printer came in.



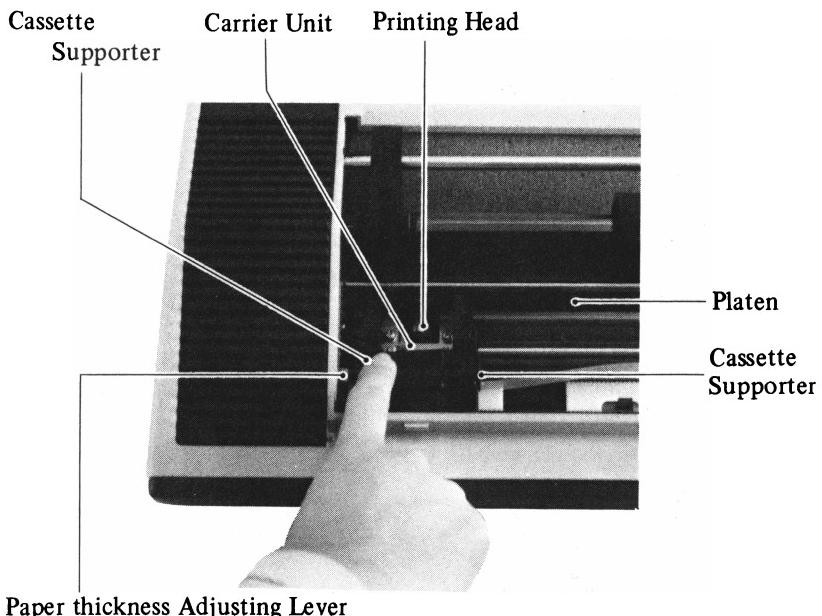
2.1

- b. Remove the ribbon cassette from the packet and place it carefully in front of you.
- c. Look at the cassette. You will notice that one side has a ribbon advance knob.
- d. Rotate ribbon advance knob in the direction of the arrow until all the slack is taken out of the ribbon. (See 2.2)



2.2

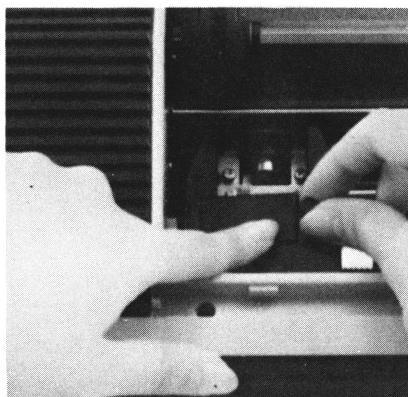
- e. Pull the paper thickness adjusting lever toward the front of the printer until it stops. (Pull it while pushing outward.) (See 2.12)
- f. Place the ribbon cassette on the carrier unit. Be sure that the ribbon is between the print head and the platen. (See 2.3)
- g. Push down the left side of the ribbon cassette with your finger. Be sure that the left claw snaps into the cassette supporter of the carrier unit. (See 2.3)



Paper thickness Adjusting Lever

2.3

- h. Push down the right side of the cassette while turning the cassette knob clockwise. (See 2.4) Be sure that right claw snaps into the cassette supporter of the carrier unit. After fitting, add more tension to the ribbon by again turning the cassette knob in the direction shown by the arrow.



2.4

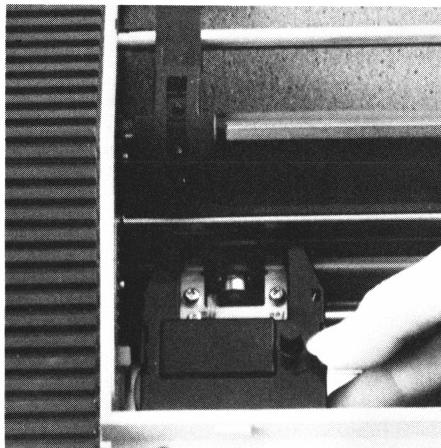
1. Return the paper adjusting lever to the original position.

Caution

DO NOT TRY TO MOVE THE CARRIER UNIT (INCLUDING THE PRINTING HEAD) MANUALLY. FORCING THE CARRIER UNIT MAY CAUSE DAMAGE TO THE PRINTER.

2.2 Removing the Ribbon Cassette (See 2.5)

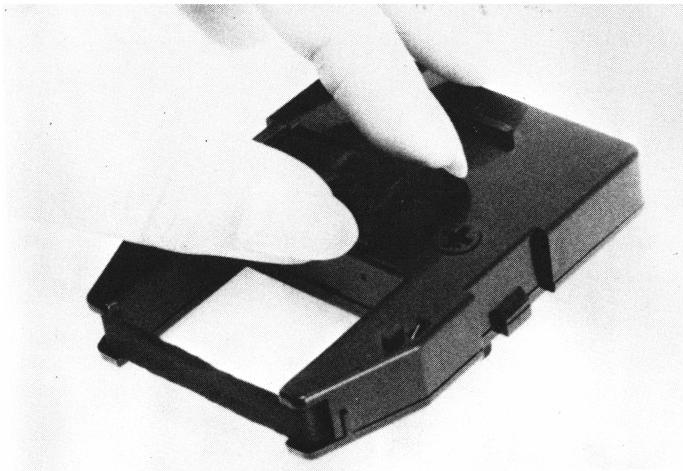
- a. Pull the paper thickness adjusting lever toward you until it stops.
- b. Release the right cassette supporter by pressing outward with your right thumb. And at the same time push up the bottom of the cassette with your right middle finger. (Completed)



2.5

2.3 Replacing of the Inker (See 2.6)

Turn over the ribbon cassette, remove the inker by pulling it out. Insert a new inker.



2.6

3. Paper Instructions

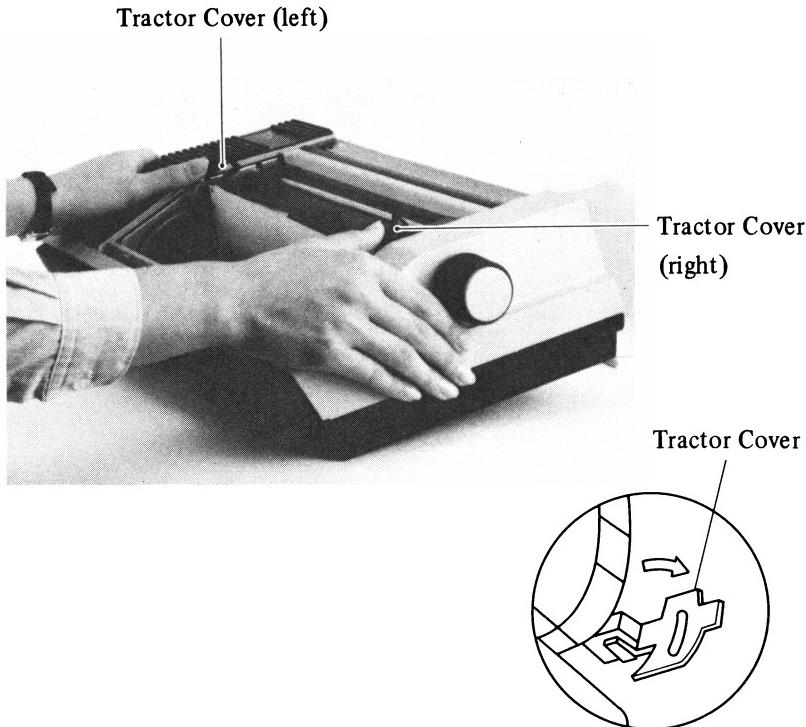
3.1 Paper Loading Instructions (See Appendix A for Paper Specification)

- a. Make sure that the power on your printer is turned OFF before loading the paper.
- b. Remove the printer cover by holding the rear of cover and lifting it up. (See 2.7)



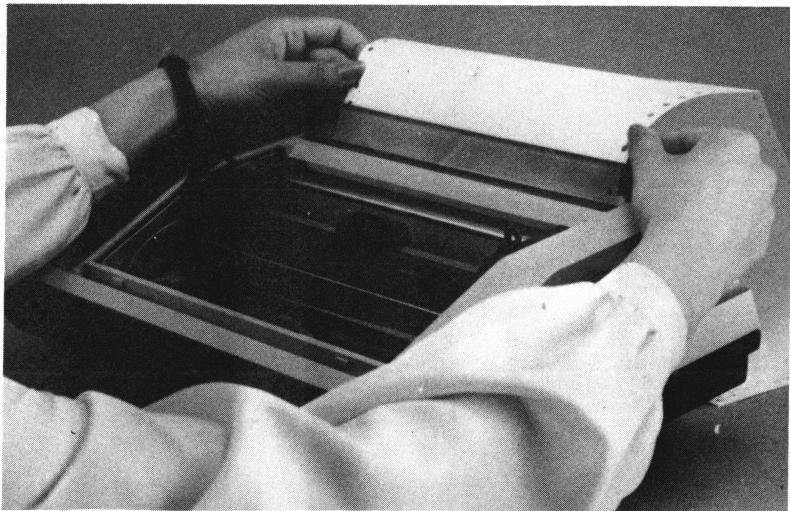
2.7

- c. Pull the paper thickness adjusting lever toward the front of the printer until it stops. Open the right and left tractor covers.



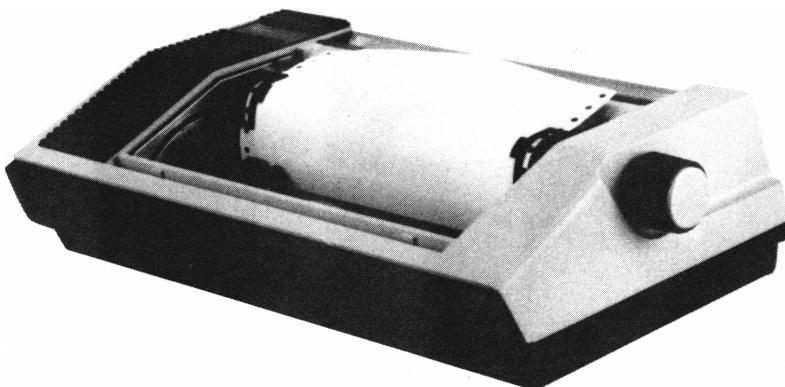
2.8

- d. Insert paper between the paper shelf and the lower frame using both hands. (See 2.9)
- e. Feed the paper until comes out between the printing head and the platen.



2.9

- f. Adjust the paper on to the feed pins of the tractor on sides. Then close the tractor covers. (See 2.10) If the holes and the width of the paper are not aligned, shift the paper sideways until the spacing is correct. Then pull the paper from behind the printer to remove any slack. Return the paper thickness adjusting lever to the original position.



2.10

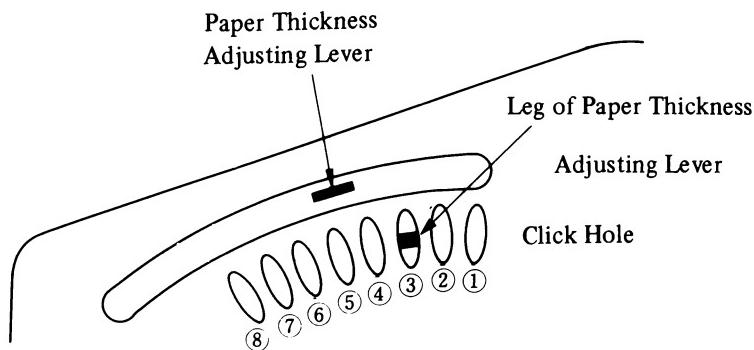
- g. Replace the printer cover. (See 2.11) Adjust printing position by turning the paper feed knob.



2.11

3.2 Printing Pressure Adjustment

You may adjust the printer pressure of the print head according to the thickness of the paper. If smudging occurs or if printing is too dark, move this lever one click hold towards the front of the printer at a time until you are satisfied with the printing quality; if printing is too light, move it towards the rear printer. When adjusting the lever, make sure that it is placed directly in the hole, not "in between" them.



2.12 Left Inside

At the time of shipment, the lever's leg is at the position ③. Place the leg at the position ⑧ when fitting and removing a ribbon cassette.

4. Connecting the Printer to Your Computer

To connect your printer to your Commodore computer, please follow the instructions in the order listed below.

- a. Make sure that both your computer and printer have their power turned OFF.
- b. Connect one end of the 6-pin DIN cable to the connector holes located in the back of your printer at the lower left. This cable is "keyed" so that you cannot plug the cable in the wrong way. This means that the pins should be positioned so that a slight pressure will seat the cable properly. Do not force these pins in, doing so could damage your cable.
- c. Connect the other end of the cable to your computer in the Serial Port Connector located in the back of your computer. Make sure that you are "keying" the pins properly into the connector with 6 holes.
- d. Now plug the printer's power cord into a standard AC wall outlet. However, please do NOT turn the equipment on yet.

5. Performing the Printer Power-On Test

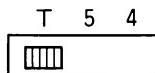
Please do NOT turn on your computer until after you have completed the next two sections.

- a. Turn on your printer. The print head should move to the center of the carriage automatically and then return to the original position. If this doesn't happen, go to step "b".
- b. If the print head does not move as described above, check to see if the connecting cable is properly plugged in. After checking all connections turn your printer on and try the test again.

6. Performing the Print Head Test

You can test the print head and ribbon ONLY AFTER INSERTING PAPER. DO NOT PRINT WITHOUT PAPER; it could easily damage your print head. To perform the test, simply switch the self-diagnostic switch to

"T" (shown in Fig. 2.9). The printer will continue to print all the characters available until 1) the printer is turned off; or 2) the self-diagnostic switch is "flipped" to position 4 or 5. When the printing is finished, remove the paper from the machine and examine it for defects. Please report any problems immediately to your local Commodore dealer so that your printer can be properly serviced. A typical printout for the VIC 20 is shown below.



2.13: Test Position Selected

2.14 : Sample Printout

7. MAINTENANCE

We hope you don't have problems but just in case . . . see if you can solve them by using the table below. If you can't, then try to determine which component in your system is at fault, and bring it into a store for repair.

Problems	Probable Causes/Solutions
Printer won't print. Power Indicator 'OFF'.	1) Printer power is 'OFF'. Check the connection and the power switch. 2) Fuse may be blown. Replace only with a fuse of the same rating.
Printer won't print. Power Indicator 'ON'.	1) Improper connection. Check all the cable connections. 2) Improper ribbon setting. Re-adjust the ribbon.
Printer okay, but the paper won't advance.	Paper is jammed. Remove and reload the paper.
Printed characters are too light or smudging.	1) Improper printing pressure. Adjust the lever's position on the left inside. 2) Wrong ribbon setting. Re-adjust the ribbon 3) Old or worn-out ribbon. Replace the ribbon.

8. CAUTIONS

- Wait at least two seconds to turn on the power after it is turned off, otherwise the Printer will not be initialized properly.
- Never place the Printer where it is exposed to direct sunlight.
- Never apply power while you are plugging in or unplugging an input connector.
- Never turn off the power while the Printer is in motion.
- Never try to move the print head manually, whether the power is on or off.
- Do not stop the print head motion while it is printing.
- Do not print without paper and/or ribbon because the print head might be damaged.
- Turn off the power quickly and remove a foreign object, if you drop it into the Printer.
- Do not subject the Printer to temperatures below 5°C or above 40°C during operations, or to a sudden change in temperature.
- Regarding printing duty:
In graphic mode, using patterns with too much dot density will wear out the print head faster. We recommend that you use patterns whose dot density is equal to that of ordinary alphanumerics. The continuous printing of high dot density patterns may adversely affect the longevity of the print head.
- Unplug the power cord before trying to take off the outer casing.

Section 3: USING YOUR PRINTER

Introduction

Now that you've learned how to insert the ribbon and paper into your printer, connect the printer to your computer, and how to test your printer for problems, you're ready for the next step: putting the printer to work for you.

Your printer does a lot more than give a clean, fast printing of your work. It has its own internal microprocessor (computing system) which makes it both versatile and practical. In addition, it doesn't need to use up precious memory space in your computer because it stores everything you want to print in its own memory.

In this section we will show you how to use your printer to print listings, program results, and graphic displays. You will also see how to make double width characters and even how to create a few custom designed graphics. But before you go any farther in this manual, make sure that you are able to do the following:

1. Operate your Commodore computer.
2. Write elementary programs in BASIC.
3. Read and write files to and from a peripheral device, like a tape cassette recorder or disk drive.
4. Open and close files.

If you are not familiar with any of the above procedures, check your computer's User's Manual for the information you need.

1. Special Printer-Associated Commands

When you want to print something on your printer, essentially what you are doing is transferring the video screen function to the printer. A few special **BASIC** commands allow you to make this transfer. Most of the other rules and syntax of **BASIC** remain the same. Don't forget to type the RETURN key after each line of information.

The OPEN Command

This command creates a correspondence between a file number and a

physical device. The **logical file number (lfn)** may be any number from 1 to 255. It doesn't matter which number you choose, as long as you keep the same number throughout your set of commands.

The **device number (dn)** refers to the device to which you send the file. The first device number is also known as the primary address. If you are using a MPS-801 printer, the dn (device number) is usually 4. Check the test switch on your printer to see what dn to choose.

The **secondary address (sa)** is an optional and unique printer concept. Secondary addresses on this printer provides the following printer options.

- Sa= 0: Print data exactly as received
- Sa= 6: Setting spacing between lines
- Sa= 7: Select business mode
- Sa= 8: Select graphic mode
- Sa=10: Reset the printer

The SYNTAX for the OPEN Command is:

OPEN lfn, dn	or	OPEN lfn, dn, sa
OPEN 99, 4	or	OPEN 1, 4, 0
OPEN 2, 4	or	OPEN 26, 4, 7

The CMD Command

The CMD command transfers control from the computer to the printer. The lfn (logical file number) must be the same as the one you chose for the OPEN command. If you are using more than 1 OPEN command, each CMD command must have the same number as the corresponding OPEN command. Unlike a PRINT# command (which is discussed next), the line to the receiving device (in this case your printer) is left open. The device given the CMD command is said to be "listening." That means that once you give the CMD command, your printer will print READY and it will then be open and waiting for further instructions. At this point, any PRINT or LIST command will go directly to the printer as output.

The SYNTAX for the CMD Command is:

CMD lfn
CMD 99
CMD 2
(notice that the CMD logical file numbers correspond to the OPEN lfn's)

The PRINT# Command

The PRINT# command works just like the BASIC command PRINT except that it directs the output to the printer instead of to the video screen. After the data you have sent to the printer is finished, the lfn is automatically closed. This is called "unlistening" and it means that in order to PRINT# more data, you must re-open the file by using another CMD command. By the way, please notice that you can NOT leave a space between PRINT and # or the command will not work.

NOTE: In CBM BASIC V2, the PRINT command can be abbreviated by using a "?". You can NOT do this with PRINT#. You must always type PRINT# in full.

The SYNTAX for the PRINT# Command is:

```
PRINT# lfn, data  
PRINT# 99, "HELLO VIC"  
PRINT# 2, CHR$(124),123,63,76
```

The CLOSE Command

The CLOSE command is a very important command to use efficiently. You should always CLOSE a file after you've printed from it. The reason is that you can only have a maximum of 10 files open at anytime. Therefore, if you make a habit of closing files when you've finished with them, you will always have the maximum number of files available.

NOTE: Since the CMD command does not close the line to the printer, you must always follow a PRINT# command with the CLOSE command in order to properly close a file.

The SYNTAX for the CLOSE Command is:

```
CLOSE lfn  
CLOSE 99  
CLOSE 2
```

EXAMPLES Using all commands correctly:

```
OPEN 99, 4  
PRINT# 99, "HELLO VIC"  
CLOSE 99
```

```
OPEN 99, 4
CMD 99, "HELLO VIC"
PRINT# 99; CLOSE 99
```

```
OPEN 2, 4
PRINT#2, CHR$(124), 123, 63, 76
CMD 2
PRINT# 2
CLOSE 2
```

2. Printing in the Direct Mode

Now that you have gone through the various printing commands and what they do, let's put them to use in practical applications. The DIRECT mode allows you to communicate with your printer by entering printing commands DIRECTly from the keyboard of your computer.

The following example illustrates the entire DIRECT mode listing process in a short BASIC program. In this example, a file containing a single BASIC statement is typed into the computer's memory. The file is then OPENed. The output channel to the printer is opened and the printer is "listening" using the CMD command. The file is LISTed. The output channel is closed using the PRINT# command. Finally the file is CLOSEd. The printer is now out of use and the computer is ready to accept new commands.

	You type:	The screen displays:	The printer prints:
①	10?"TEST"		10?"TEST"
②	OPEN3, 4		OPEN3, 4 READY.
③	CMD3	CMD3	READY.
④	LIST	LIST	10 PRINT"TEST" READY.
⑤	PRINT#3	PRINT#3	
⑥	CLOSE3	CLOSE3	

Explanation of above program:

- (1) Data placed in the computer's memory.
- (2) You OPEN a file and give it a logical file number (lfn) of 3. The 4 (following the comma) makes the file available to the printer.
- (3) The printer is "listening."
- (4) The program is LISTed onto the printer. The printer is still "listening."
- (5) Use the PRINT# command to "unlisten" the printer.
- (6) You CLOSE the file so that the lfn 3 can be used for something else.

3. Printing Under Program Control

Now that you have seen how to control the printer directly from the keyboard, it's time to control the printer from within a BASIC program. The short BASIC example below would already be in the computer's memory. It could have been placed there from the keyboard, a cassette tape, or a floppy disk.

```
10 OPEN3,4
20 CMD3
30 PRINT"PROGRAM CONTROL"
40 LIST      3.2
```

The RUN command is given and the resulting printout is shown here:

PROGRAM CONTROL

```
10 OPEN3,4
20 CMD3
30 PRINT"PROGRAM CONTROL"
40 LIST
READY.      3.3
```

REMEMBER THIS! When using the LIST command within a program execution, you must type the PRINT# command to close the channel. Then type the CLOSE command to close the file after you have finished RUNning the file. Although this works, it is NOT good programming practice. It is suggested that you only use the CMD command and DIRECT mode.

4. Secondary Address

This printer has 2 secondary address (sa). They are used to the character font table.

sa = 0 : "cursor up" (graphic) mode (default)
sa = 7 : "cursor down (business) mode

The following example tell you how to use secondary address.

```
100 OPEN4,4
110 PRINT#4,"      ASCII CODE TABLE"
120 PRINT#4
130 A$="0123456789ABCDEF"
140 PRINT#4," | ";
150 FOR I=1 TO 16:PRINT#4,MID$(A$,I,1)" ";:NEXT
160 PRINT#4
170 PRINT#4,"—";
180 FOR I=1 TO 16:PRINT#4,"—";:NEXT
190 PRINT#4
200 FOR I=1 TO 16
210 PRINT#4,MID$(A$,I,1)+" ";
220 FOR J=I-1 TO 255 STEP 16
230 IF J<32 THEN GOSUB 330:GOTO 260
240 IF J>127 AND J<160 THEN GOSUB 330:GOTO 260
250 PRINT#4,CHR$(J)" ";
260 NEXT J
270 PRINT#4
280 NEXT I
290 PRINT#4:PRINT#4
300 CLOSE4
310 END
320 :
330 PRINT#4," ";
340 RETURN
```

Above program makes "cursor up" (graphic) mode code table.

ASCII CODE TABLE

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	@	P	-	~						^	-	~		^	~
1	!	1	A	Q	◆	●					■	+	◆	●	■	+
2	"	2	B	R	!	-					■	T	-	-	■	T
3	#	3	C	S	-	◆					—	T	-	◆	-	T
4	\$	4	D	T	-	-					—	-	-	-	-	-
5	%	5	E	U	-	/					—	-	-	/	—	-
6	&	6	F	V	-	X					■	-	-	X	■	-
7	'	7	G	W	!	0					-	-	0	!	-	
8	(	8	H	X	!	†					■	-	†	†	■	-
9	)	9	I	Y	~	-					■	-	~	-	■	-
A	*	:	J	Z	~	◆					—	—	◆	-	—	—
B	+	;	K	[~	+					—	—	+	+	—	—
C	,	<	L	E	L	~					■	—	—	~	■	—
D	-	=	M]	~	-					—	—	~	-	—	—
E	.	>	N	↑	/	π					—	—	π	—	—	—
F	/	?	O	←	Γ	~					—	—	~	—	—	—

3.5

If you change the above program in line 100, 110.

```
100 OPEN4,4,7
110 PRINT#4,"      ASCII CODE TABLE"
```

New Program makes "cursor down" (business) mode code table.

ascii code table

	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
0	0	@	P	-	P		r	-	P		r					
1	!	1	a	q	A	Q	■	+	A	Q	■	+				
2	"	2	b	r	B	R	■	+	B	R	■	+				
3	#	3	c	s	C	S	■	+	C	S	■	+				
4	\$	4	d	t	D	T	■	+	D	T	■	+				
5	%	5	e	u	E	U	■	+	E	U	■	+				
6	&	6	f	v	F	V	■	+	F	V	■	+				
7	'	7	g	w	G	W	■	+	G	W	■	+				
8	(	8	h	x	H	X	■	+	H	X	■	+				
9	)	9	i	y	I	Y	■	+	I	Y	■	+				
a	*	:	j	z	J	Z	■	+	J	Z	■	+				
b	+	;	k	[	K	+	■	+	K	+	■	+				
c	,	<	l	£	L	■	■	+	L	■	■	+				
d	-	=	m	]	M	]	■	+	M]	■	+				
e	.	>	n	↑	N	✗	■	+	N	✗	■	+				
f	/	?	o	←	O	■	■	+	O	■	■	+				

3.6

5. Printing Modes and Control Codes

You can also use your printer and the PRINT#, CMD and PRINT commands in conjunction with CHR\$ codes to do the following:

DESCRIPTION	INPUT CODE
Enter Graphic Mode	CHR\$(8)
Line Feed After Printing	CHR\$(10)
Carriage Return	CHR\$(13)
Enter Double Width Character Mode	CHR\$(14)
Enter Standard Character Mode	CHR\$(15)
Tab Setting the Print Head	CHR\$(16)
Enter Cursor Down Mode	CHR\$(17)
Start Reverse Field	CHR\$(18)
Repeat Graphics Selected	CHR\$(26)
Specify Dot Address (must follow Print Head Tab Code)	CHR\$(27)
Enter Cursor Up Mode	CHR\$(145)
Turn Off Reverse Field	CHR\$(146)

5.1 Standard Character Mode

When the printer is turned on, it is set to start in the STANDARD CHARACTER mode. But once you select different character modes the printer will remain in that mode until a different one is chosen using the CHR\$(code. For the example below, we started in double width mode "CHR\$(14)" for the title and then went to the stand character mode "CHR\$(15)" to list the program.

MPS-801 PRINTER

```
10 OPEN1,4
20 PRINT#1,CHR$(14)"MPS-801 PRINTER"
30 PRINT#1,CHR$(15)
40 CMD1:LIST
```

READY. 3.7

5.2 Double Width Character Mode

To print in the DOUBLE WIDTH CHARACTER mode, use the CHR\$(14) code and follow the example below.

```
10 OPEN2,4
20 PRINT#2,CHR$(14)"MPS-801 PRINTER"
30 CLOSE2
```

RUN

MPS-801 PRINTER

3.8

5.3 Graphic Mode

By using CHR\$(8) you enter the GRAPHIC mode. This allows you to design and print graphics by inputting data. Each DATA statement is made of numbers that represent a row of dots which, when READ all together, will make up your graphic. To design your graphic, follow the example below. You should notice that each

number in the DATA statement corresponds to 1 row in your graphic. To design a graphic, follow these steps:

1. Get a separate piece of paper to design your picture.

2. Number 7 consecutive rows like this:

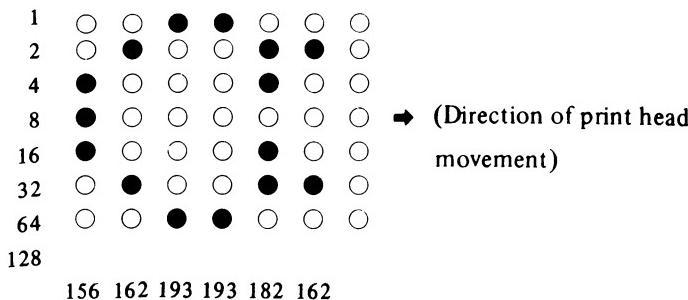
1
2
4
8
16
32
64

3. Now design your graphic in dot form (see the example below).

4. Add together all the numbers from the column on the left, only wherever you have placed a dot in a row. In our example, the first column has 3 dots located in rows 4, 8, 16. Added together they equal 28.

5. Now add 128 to the total you had for each column in step 4. In our example we add 128 to 28 for a total of 156.

6. Put your final total for each column into a data statement in column order.



The DATA statement in your program will read:

DATA 156, 162, 193, 193, 182, 162

The following program will print COMMODORE with its logo 4 times.

```
10 DATA156,162,193,193,182,162
20 FOR I=1 TO 6
30 READ A
40 A$=A$+CHR$(A)
50 NEXT I
60 OPEN3,4
70 FOR I=1 TO 4
80 PRINT#3,CHR$(8)A$
90 PRINT#3,CHR$(15)" COMMODORE"
100 NEXT I
110 CLOSE3
```

After typing RUN, you get this result:

```
C COMMODORE
C COMMODORE
C COMMODORE
C COMMODORE
```

3.9

5.4 Print Position Determination

With the CHR\$(16) code you can determine the print start position. This is done by assigning a 2-digit number following the CHR\$(16) (see the examples below).

Example 1

```
10 OPEN4,4
20 FOR I=1 TO 4
30 PRINT#4,"0123456789";
40 NEXT I
50 PRINT#4,CHR$(16);
60 PRINT#4,CHR$(16)CHR$(48)CHR$(56)
    "MPS-801";
70 PRINT#4,CHR$(16)CHR$(51)CHR$(48)
    "PRINTER"
80 CLOSE4
```

RUN

0123456789012345678901234567890123456789

MPS-801

PRINTER

3.10

Example 2

```
10 OPEN4,4
20 FOR I=1TO4
30 PRINT#4,"0123456789";
40 NEXT I
50 PRINT#4,CHR$(10);
60 PRINT#4,CHR$(16)"08MPS-801";
70 PRINT#4,CHR$(16)"30PRINTER"
80 CLOSE4
```

RUN

0123456789012345678901234567890123456789

MPS-801

PRINTER

3.11

The 2-digit numbers following the CHR\$(16) code are the print start position of your standard characters. This can be proven using the following example.

```
10 OPEN4,4
20 FOR I=1TO4
30 PRINT#4,"0123456789";
40 NEXT I
50 PRINT#4,CHR$(10);
55 PRINT#4,CHR$(14);
60 PRINT#4,CHR$(16)"08MPS-801";
70 PRINT#4,CHR$(16)"30PRINTER"
80 CLOSE4
```

RUN

0123456789012345678901234567890123456789

MPS-801

PRINTER

3.12

5.5 Print Start Position-Dot Address

Using the CHR\$(27), the absolute address (dot units) can be specified via the following format.

CHR\$(27)	CHR\$(16)	CHR\$(0)	CHR\$(15)
-----------	-----------	----------	-----------

3.13

The 2 bytes that follow CHR\$(27) and CHR\$(16) are binary data used to indicate the absolute address away from the home position (dot units).

	D ₇	D ₆	D ₅	D ₄	D ₃	D ₂	D ₁	D ₀	
1st byte	O	O	O	O	O	O	O	P ₈	Higher 1 bit (HP)
2nd byte	P ₇	P ₆	P ₅	P ₄	P ₃	P ₂	P ₁	P ₀	Lower 8 bits (LP)

3.14

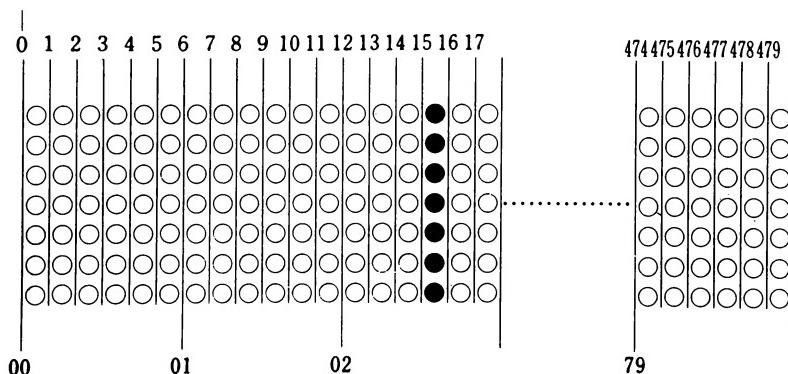
The above 2 bytes are used to indicate the starting print position and are treated as a single 9 bit binary notation data inside the Printer.

P ₈	P ₇	P ₆	P ₅	P ₄	P ₃	P ₂	P ₁	P ₀
----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------

3.15

For example the dot address 15 can be determined by HP=CHR\$(0), LP=CHR\$(15).

dot address



character address

3.16

The following program will print COMMODORE and its logo from the 100th dot position (16 characters plus 5 dots).

```
10 DATA8,27,16,0,100
20 DATA156,162,193,193,182,162,15
30 FOR I=1TO12
40 READ A
50 R$=R$+CHR$(A)
60 NEXT I
70 OPEN5,4
80 PRINT#5,R$" COMMODORE"
90 CLOSE5
```

RUN

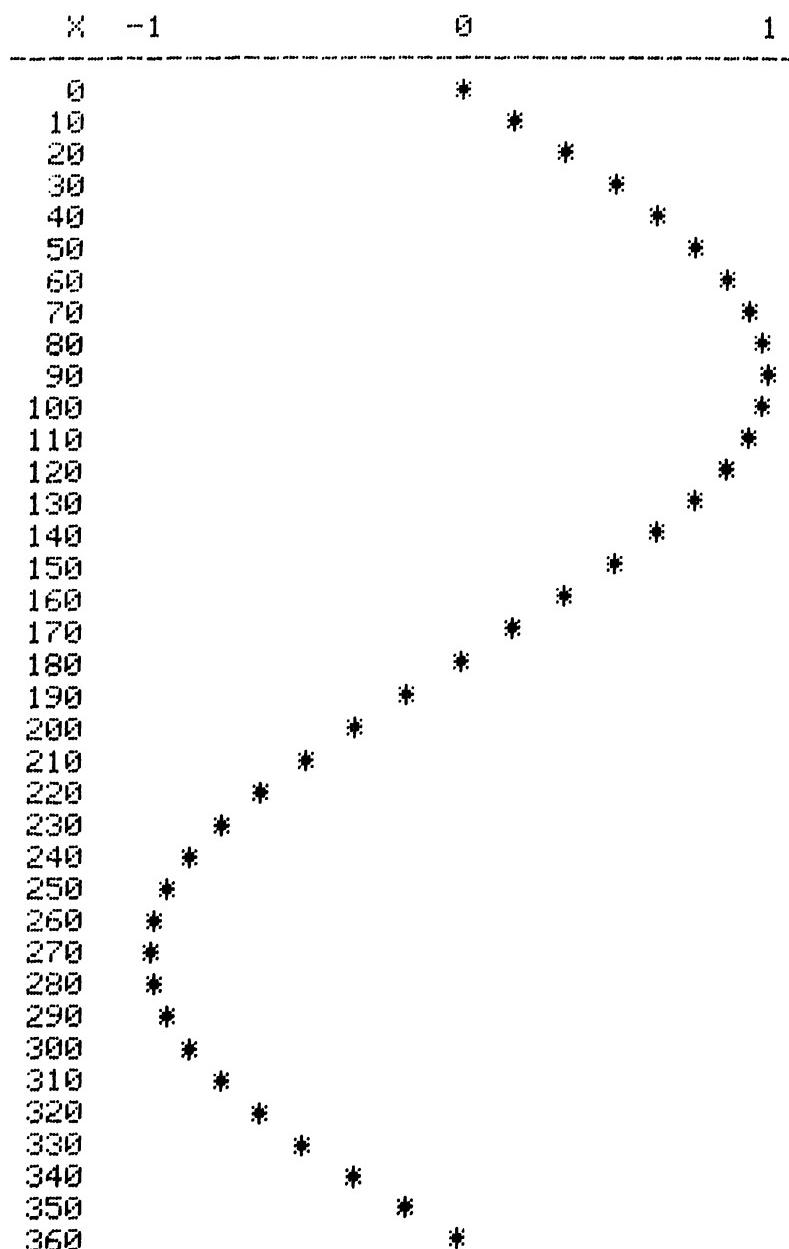
C COMMODORE

3.17

Using to change a print start position-dot address, try to make sine curve. The following is a sample program.

```
100 OPEN4,4:CMD4
110 S0$=CHR$(14):S1$=CHR$(15)
115 P0$=CHR$(16):ESC$=CHR$(27)
120 CN=23:AM=16:OF=4
130 A$="-":FOR I=0TOCN+AM:A$=A$+"-":NEXT
140 SP$="          "
150 PRINTS0$"      SIN CURVE"
160 PRINTSI$
170 PRINTLEFT$(SP$,OF-1)+"X";
180 PRINTSPC(CN-AM-OF-1)"-1";
190 PRINTSPC(AM-1)"0";
200 PRINTSPC(AM-1)"1"
210 PRINTA$
220 FOR I=0TO360STEP10
230 I$=RIGHT$(SP$+STR$(I),OF)
240 Y0=CN*6+AM*6*SIN(I*pi/180)
250 YH=INT(Y0/256):YL=Y0-YH*256
270 PRINT I$ESC$P0$CHR$(YH)CHR$(YL) "*"
280 NEXT
290 PRINT#4:CLOSE4
```

SIN CURVE



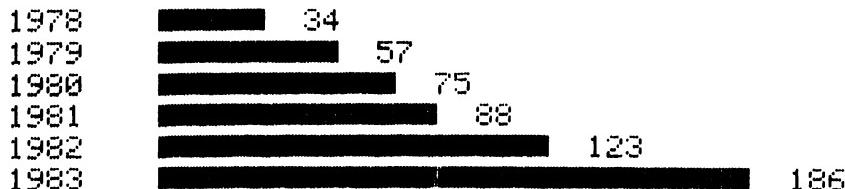
5.6 Repetition of Graphic Data

By using CHR\$(26) you can repeat graphic data where you wish.

CHR\$(8)	CHR\$(26)	NUMBER OF REPETITION	DATA
----------	-------	-----------	----------------------	------

3.19

What is actually repeatable is just 1 column of graphic information. The following example uses a CHR\$(26) code to draw the graphic.



```
10 OPEN6,4
20 FORI=1 TO 6:READA:A$=A$+CHR$(A):NEXT
30 FORJ=1 TO 4:READB:B$=B$+CHR$(B):NEXT
40 FORK=1 TO 6:READC:C$=CHR$(C)
50 D$=STR$(1977+K)
60 PRINT#6,CHR$(15)D$A$C$B$C
70 NEXT
80 CMD6:LIST
90 DATA 8,27,16,0,53,26
100 DATA 255,59,15,32
110 DATA 34,57,75,88,123,186
```

READY.

3.20

5.7 Cursor Up Mode

By sending the CHR\$(145) Code to your printer, following characters will be printed in graphic mode (cursor up mode) until either a carriage return or down cursor is detected. (Note: This is the power on default).

Example

```
10 OPEN7,4,7:CU$=CHR$(145):CD$=CHR$(17)
20 PRINT#7, CU$"♠" "CD$"SPADE"
30 PRINT#7, CU$"♥" "CD$"HEART"
40 PRINT#7, CU$"♦" "CD$"DIAMOND"
50 PRINT#7, CU$"♣" "CD$"CLUB"
60 CLOSE7
```

♠ spade
♥ heart
♦ diamond
♣ club

3.21

5.8 Cursor Down Mode

By sending the CHR\$(17) code to your printer, following characters will be printed in cursor down (business) mode until either a carriage return or up cursor is detected.

Example

```
10 OPEN8,4:CU$=CHR$(145):CD$=CHR$(17)
20 PRINT#8,CD$"SPADE" "CU$"♠"
30 PRINT#8,CD$"HEART" "CU$"♥"
40 PRINT#8,CD$"DIAMOND" "CU$"♦"
50 PRINT#8,CD$"CLUB" "CU$"♣"
60 CLOSE8
```

spade ♠
heart ♥
diamond ♦
club ♣

3.22

5.9 Reverse Field Mode

By selecting the CHR\$(18) you have turned on the REVERSE FIELD mode. This prints white letters on a black background.

**Personal Computer
Dot Matrix Printer**

```
10 oPen9,4,7
20 Print#9,chr$(18)" Personal Computer "
30 Print#9,chr$(18)" Dot Matrix Printer "
40 cmd9:list

ready.
```

3.23

5.10 Reset Reverse Field Mode

When you use CHR\$(146) you turn OFF the REVERSE FIELD mode that you selected by using the CHR\$ in chapter 4.9.

**Personal Computer
Dot Matrix Printer**

```
10 oPen10,4,7
20 Print#10,chr$(18)" Personal Computer "
30 Print#10,chr$(146)" Dot Matrix Printer "
40 cmd10:list

ready.
```

3.24

5.11 Mixture of Various Print Mode

You can use the following example to get an idea as to how to combine more than 1 print mode, even in one line.

© COMMODORE

```
10 DATA 8,27,16,0,36
20 DATA 156,162,193,193,182,162
30 FOR I=1TO5:READA:A$=A$+CHR$(A):NEXT I
40 FOR J=1TO6
```

```
45 READB:B$=B$+CHR$(B)+CHR$(B)
50 NEXT J
60 OPEN11,4
70 PRINT#11,A$B$CHR$(14)" COMMODORE"
80 PRINT#11,CHR$(15)
90 CMD11:LIST
```

READY. 3.25

5.12 Line Feed Spacing

Linefeeds are executed in accordance with the print mode in effect just prior to the execution of a print command.

- Character and double width character modes 6 LPI
- Graphic mode 9 LPI

Example

```
10 OPEN12,4:SI$=CHR$(15):BS$=CHR$(8)
20 PRINT#12,SI$" " "BS$"
30 PRINT#12,SI$" | | "BS$"
40 PRINT#12,SI$" | | "BS$"
50 PRINT#12,SI$" | | "BS$"
60 PRINT#12,SI$" | | "BS$"
70 CLOSE4
```

RUN

3.26

5.13 Data Buffer Size

Your printer's print-line buffer can contain up to 90 bytes of data. At least 1 byte will be used for the CHARACTER code mode. But ... since your printer provides you with automatic printing, you are guaranteed that no loss of data due to overflow will occur. This means that you really don't have to worry about buffer size. In addition to the print data, the following will also be included in your buffer:

Input Code	Bytes
CHR\$(8) .....	.1
CHR\$(10) .....	.1
CHR\$(13) .....	.1
CHR\$(14) .....	.1
CHR\$(15) .....	.1
CHR\$(16)/CHR\$(0)/CHR\$(15) .....	.3
CHR\$(17) .....	.1
CHR\$(18) .....	.1
CHR\$(26)/number of repetitions/mark data .....	.3
CHR\$(27)/CHR\$(16)/CHR\$(0)/CHR\$(15) .....	.3
CHR\$(145) .....	.1
CHR\$(146) .....	.1

6. Automatic Printing

Automatic printing will occur under 3 conditions. In order to understand exactly what's happening, you have to have a little knowledge about how your printer works. First, each printed character is made from 6 rows of dots. Next, you can have up to 80 characters per printed line (spaces count as 6 dot positions just like letters and numbers). This means that there are a total of 480 dots per line. Now you're ready for the 3 conditions.

- a. When the buffer fills up during the input of data.
- b. When your printer "sees" that you have used up more than the 480 dots per line that was described above.
- c. When both a and b happen at the same time.

What will happen when these conditions occur?

- a. When the buffer fills during printing, it prints out everything it has been storing onto your paper. But . . . it remembers where it stopped printing so that it can continue from that point, when and if you want to. Or, it will print again when you fill the buffer again.
- b. When the printer uses up more than 480 dots, then it prints out the line and then stops and tells you that it's READY for more information.
- c. When both a and b occur, your printer will "dump" only the first 80 characters and print them. Then it will move to the next line. At this point, the printer will do 2 things: 1) It will hold any characters that have been left in the buffer and add to them; 2) It will give you a READY for more information statement.

APPENDIX A SPECIFICATIONS

1. General Specifications

- A. Print method Impact dot matrix print(uni-hammer method)
- B. Character matrix 6 x 7 dot matrix
- C. Characters Upper/lower case characters, numerals, symbols, and PET graphic characters
- D. Graphics Dot addressible. 7 vertical dots per column, max 480 columns.
- E. Character codes CBM ASCII CODE
- F. Character size Height: 7 dots (2.82 mm)
Width : 6 dots (2.53 mm)
- G. Print speed. 50 characters/sec (left to right, unidirectional)
- H. Max. number of columns 80 columns
- I. Character spacing 10 characters/inch
- J. Linefeed spacing 6 lines/inch Character mode
9 lines/inch Graphic mode
- K. Linefeed speed 5 linefeeds/sec Character mode
7.5 linefeeds/sec Graphic mode
- L. Paper feed Pin feed
- M. Paper width 4.5 to 10" width (including tractor feed holes)
8½" width (after tractor hole removed)
- N. Multiple copies 2 copies including original
- O. Inked ribbon Single color, inked roller built-in cassette type
- P. External dimensions 237D × 438W × 115H mm
- Q. Weight Approximately 4.8 kg

2. Operating Environment

- A. Power requirements 120V (USA), 220 ~ 240V (Europe)
AC ± 10%, 50/60 Hz
- B. Power consumption 25 watts max. (character printing)
8 watts (idling)
- C. Temperature 5°C ~ 40°C
- D. Humidity 20% ~ 80% (no condensation)

APPENDIX B Hard Copy of the Screen

The following sample program can be used to get a hard printed copy of a program you have on your screen. The Program is made to be used as a sub-routine. That means that when you use it, you must have a "GOSUB 60000" in your program where appropriate.

```
60000 REM SCREEN COPY
60010 SI$=CHR$(15):BS$=CHR$(8):PO$=CHR$(16)
60020 RV$=CHR$(18):RD$=CHR$(146):QT$=CHR$(34)
60030 MF$=CHR$(145):VR=PEEK(648)*256
60040 OPEN4,4:PRINT#4
60050 FORCL=0TO22:QF=0:AS$=MF$:FORRO=0TO21
60060 SC=PEEK(VR+22*CL+RO)
60070 IFSC=34THENQF=1-QF
60080 IFSC<>162THEN60110
60090 QF=1-QF:IFQF=1THENAS$=AS$+RV$+QT$:GOT060170
60100 AS$=AS$+QT$+RO$:GOT060170:GOT060130
60110 IFQF=1AND(SC)=128)THENSC=SC-128:GOT060130
60120 IFSC>=128THENSC=SC-128:RF=1:AS$=AS$+RV$
60130 IFSC<320RSC>95THENAS$=SC+64:GOT060160
60140 IFSC>31ANDSC<64THENAS$=SC:GOT060160
60150 IFSC>63ANDSC<96THENAS$=SC+32:GOT060160
60160 AS$=AS$+CHR$(AS)
60170 IFRF=1THENAS$=AS$+RO$:RF=0
60180 NEXTRO
60190 IFQF=0THENPRINT#4,SI$PO$"20"AS$:GOT060210
60200 PRINT#4,SI$:PO$;"20";AS$:QT$
60210 NEXTCL:CLOSE4:RETURN
```

B.1

This program is made for the CURSOR UP mode. If you wish to write the program in the CURSOR DOWN mode, you must change MF\$=CHR\$(145) to MF\$=CHR\$(18) in line 60030.

This program is also made for VIC-20. If you wish to use this program to Commodore 64, you should change line 60050.

```
60050 FORCL=0TO24:QF=0:AS$=MF$:FORRO=0TO39
```

Note)This program can't print the characters following the reverse quote.

APPENDIX C PRINTER Code Table

GRAPHIC MODE Code & Font Table

	O	I	2	3	4	5	6	7	8	9	A	B	C	D	E	F
O																
I																
2																
3																
4																
5																
6																
7																
8																
9																
A																
B																
C																
D																
E																
F																

Note: When an odd number of CHR\$(34) is detected in a line, the control codes \$00~\$1F and \$80~\$9F will be made visible by printing a reverse character for each of these controls. This will continue until an even number of quotes (CHR\$(34)) has been received or until end of this line.

BUSINESS MODE Code & Font Table

	O	I	2	3	4	5	6	7	8	9	A	B	C	D	E	F
O																
I																
2																
3																
4																
5																
6																
7																
8																
9																
A																
B																
C																
D																
E																
F																

Note: When an odd number of CHR\$(34) is detected in a line, the control codes \$00~\$1F and \$80~\$9F will be made visible by printing a reverse character for each of these controls. This will continue until an even number of quotes (CHR\$(34)) has been received or until end of this line.

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